

DISCUSSION OF THE AMENDMENT

Claim 1 has been amended by making more explicit what was already explicit by inserting the word --all-- before “the oxidation catalysts”. See also the specification at page 5, lines 28-30 and page 6, lines 29-31.

No new matter is believed to have been added by the above amendment. With entry thereof, Claims 1, 3, 4 and 6-8 will remain pending in the application.

REMARKS

The rejection of Claims 1, 3, 4 and 6-8 under 35 U.S.C. § 103(a) as unpatentable over US 4,774,070 (Itoh et al) in view of US 5,908,607 (Abekawa et al), is respectfully traversed.

In response to Applicants' argument that while Itoh et al discloses that a fixed-bed reactor and fluidized-bed reactor may be used in combination, there is no disclosure or suggestion of using them in a particular order, or that there is any advantage from using the combination as opposed to one kind alone, the Examiner finds that it would have been obvious to select the best order through routine experimentation and when so selected, Itoh et al would inherently have the same advantage of the presently-claimed process. The Examiner further finds that there is no comparative example or other evidence of record demonstrating criticality or unexpected results.

To that end, the newly-submitted Karches Declaration is probative.

In Experiment 3 thereof, three process variants (1), (2) and (3) were studied. Karches declares that the combination (3) of a fluidized-bed stage at 340°C and a fixed-bed stage at 300°C gives higher HCl conversions than a pure fixed-bed stage (2) at 300°C. Note that a pure fixed-bed stage cannot be operated at 340°C, since the reaction rate is then so high in the initial region of the catalyst tubes that hot spots are formed and the catalyst undergoes severe sintering, as shown in Experiment 2. Karches further declares that the advantage of the combination (3) over purely fluidized-bed operation (1) is that only half of the catalyst has to be replaced since only the catalyst of the fluidized-bed stage becomes deactivated. The other half of the catalyst in the fixed-bed stage does not become deactivated. However, the same conversion is achieved by means of the combination (3) as when pure fluidized-bed stage (1) is used.

The combination of (3) therefore represents, as Karches declares, at constant conversions, a more economical mode of operation than purely fluidized-bed operation (1). Compared to purely fixed-bed operation (2), higher conversions are achieved.

Itoh et al and Abekawa et al in combination could not have predicted the above results flowing from the use of a fluidized bed operated at 340°C (i.e. from 280 to 360°C) as a first oxidation zone and a fixed bed operated at 300°C (i.e. from 220 to 320°C) as the second oxidation zone, when ruthenium oxide on a support is used as a catalyst.

Nor are the differences between the present invention and Itoh et al limited to the above combination of beds and the use of a ruthenium catalyst on a particular support.

Neither prior art reference is directed to addressing the specific problem of the formation of “hot spots” which adversely affect the life of the catalyst on the one hand, and the problem of low space-time yields associated with reaction temperatures low enough to avoid such hot spots, on the other hand, as described in the specification beginning at page 1, line 24. Nor does the prior art recognize the inventors’ finding that, when employing a catalyst containing ruthenium oxide on a support material, the formation of hot spots can be avoided by carrying out a first oxidation stage in a fluidized-bed reactor at a temperature from 280 to 360°C until a hydrogen chloride conversion of at least 40% and at most 80% is reached, and carrying out a second oxidation stage in a fixed-bed reactor at a temperature from 220 to 320°C. At the same time, a sufficiently high space-time yield is achieved, since the first oxidation stage is carried out at a rather high temperature, and complete conversion of hydrogen chloride is achieved since the second reaction stage is carried out at a lower temperature in order to achieve the optimum thermodynamic equilibrium position. Since partial conversion takes place in the first fluidized-bed stage b) and the resulting gas stream is diluted with product gases, there remains only a small risk of formation of hot spots in the (second) fixed-bed reactor stage c).

Thus, the above temperature ranges, hydrogen chloride conversion range in the first oxidation stage, and order of reactors are also factors that must be considered.

The Examiner finds that the problems of formation of hot spots and low space-time yields, as discussed above, are well-recognized in the art, as evidenced by Abekawa et al.

In reply, it is not clear what disclosure in Abekawa et al the Examiner is relying on but if the problems are well-recognized, this finding is in favor of patentability herein since Abekawa et al does not (nor does Itoh et al) disclose Applicants' solution to the problem.

For all the above reasons, it is respectfully requested that this rejection be withdrawn.

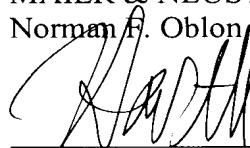
The rejection of Claims 1, 3, 4 and 6-8 under 35 U.S.C. § 112, second paragraph, is respectfully traversed. Indeed, the rejection is now moot in view of the above-discussed amendment. Accordingly, it is respectfully requested that this rejection be withdrawn.

All of the presently-pending claims in this application are now believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Respectfully submitted,

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